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**The Big-Fish-Little-Pond Effect for Reading Self-Beliefs: A Cross-National Exploration With
PISA 2018**

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Abstract

Past research shows the Big-Fish-Little-Pond Effect (BFLPE; negative effect of school-average achievement on student-level self-concept) to generalize across countries. However, evidence is largely limited to math and science, limiting conclusions of universality to these subjects. Using data from Program for International Students Assessment 2018 (533,165 students, 72 countries), the present study is the first to examine and provide robust evidence for the cross-national generalizability of the BFLPE for the reading self-concept of high school students (perceived competence and difficulty subscales). Consistent with our social-comparison perspective, we also show that the BFLPE is strong when the frame-of-reference for comparison is relative rather than absolute; the effect of school-average achievement was robust for difficulty experienced with reading in general (self-concept of perceived difficulty), but very weak for difficulty experienced specifically during the PISA reading test (PISA test difficulty). Our findings extend support for the generalizability of the BFLPE to reading self-concept.

Keywords: Big-fish-little-pond effect; reading self-concept; social comparison process; frame-of-reference; PISA

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1. Introduction

Academic self-concept is an individual's perception of their academic abilities. It is shaped by their experiences with and interpretations of their academic performance, and by others' evaluations of their abilities (Marsh & Seaton, 2015). It positively impacts academic achievement (Marsh & O'Mara, 2008), interest and satisfaction in school (Marsh et al., 2005), course selection (Marsh, Van Zanden, et al. 2019; Parker et al., 2014), persistence, and long-term attainment (Guo, Marsh et al., 2015; Guo, Parker et al., 2015), above and beyond the effects of prior achievement and IQ. Owing to its importance, it is crucial to understand how people form their self-concepts. Numerous models have been proposed. The common underlying theme in these models is that self-concept is impacted by frames of reference; self-evaluations of competence in a particular domain can be made against many standards of comparison (Marsh et al., 2020; Marsh & Seaton, 2015).

One of the most commonly studied frames of reference is the big-fish-little-pond effect (BFLPE; Marsh & Parker, 1984). Recent research has focused on testing the universality of this phenomenon, through studies using cross-national data (e.g., Marsh et al., 2020). Yet, much of this research has been dominated by studies on subjects with content that is relatively consistent across countries (e.g., math and science), while neglecting subjects whose content may differ (e.g., reading). In addition, research has shown self-concepts in the math and science domains to be vastly different—or even uncorrelated—to those in the reading domain (e.g., Möller & Marsh, 2013). Therefore, conclusions of universality drawn from the former may not necessarily extend to the latter. However, it is still important to consider as reading self-concepts are also important for educational outcomes (e.g., Sewasew & Koester, 2019). Therefore, the focus of the present investigation is to test the cross-national generalizability of the BFLPE in the domain of reading.

1.1 The Big-Fish-Little-Pond Effect

Parents and teachers often believe in the benefits of educating children in selective schools; it is assumed that students attending such schools will have a brighter and more successful future.

However, evidence tends to point to the contrary. In a seminal study conducted in the 1980s, the average ability level of a school negatively influenced individual students' academic self-concept, over and above the positive effects of individual-student ability on self-concept (Marsh & Parker, 1984). Students were found to have lower levels of academic self-concept in high-ability schools than their equally able counterparts in low-ability schools. This phenomenon occurs through a social comparison process (Festinger, 1954); humans evaluate their own abilities and form their self-perceptions through comparing themselves with others. Thus, for instance, a student who outranks their local peers in mathematics will have higher levels of math self-concept, while a student who performs below-average compared to their local peers in math will have lower levels of math self-concept, even if both students have the same level of math performance (Marsh & Basarkod, 2020).

Since the Marsh and Parker (1984) study, the BFLPE has been replicated in research studies using many diverse samples, academic disciplines, and developmental periods (see Marsh & Seaton, 2015 for an overview). Evidence for the BFLPE is strongest when examining specific domains of self-concept rather than general academic self-concept, and for older rather than younger children. This is because academic self-concept is multidimensional and hierarchical in nature (i.e., general academic self-concept is at the top, with domain-specific self-concepts such as math and reading underneath it; see Figure 1), and the domains of academic self-concept become increasingly differentiated with age (Marsh & Shavelson, 1985; Shavelson et al., 1976).

In recent BFLPE research, there has been an emphasis on replication, empirical tests, and cross-national generalizability. If evidence for a given theory—the BFLPE in this case—is found in multiple countries and cultural contexts, it can be thought of as a universal principle with pan-human validity (Segall et al., 1998; also see Marsh et al., 2020). There is now considerable empirical support for the cross-national generalizability of the BFLPE for multiple domains of self-concept, in both primary and high school students. For instance, Guo et al. (2018) found cross-cultural generalizability for the BFLPE for math, science, and reading in nationally representative samples of primary school students across 15 Organisation for Economic Co-operation and Development (OECD) countries. Their results revealed an average BFLPE beta estimate of $-.32$ for math, $-.22$ for reading, and $-.16$ for

science. However, all 15 countries from this dataset were OECD countries, which are primarily developed countries (e.g., Australia, Canada, Germany). The lack of heterogeneity in the nature of countries examined limits our understanding of the extent to which the BFLPE is generalizable across different national contexts.

Studies using data from the Program for International Students Assessment (PISA), in contrast, have provided cross-national generalizability for the BFLPE for high school students, across nationally representative samples from numerous developed and developing countries. Marsh et al. (2020) listed evidence for the BFLPE for general, math, and science domains across samples of 15-year-old students from 26-68 countries. They provided a summary of effect sizes for each country participating in the PISA rounds of 2000 (average $\beta = -.20$ for general self-concept in 26 countries; Marsh & Hau, 2003), 2003 ($\beta = -.31$ for math self-concept in 41 countries; Seaton et al., 2009), 2006 ($\beta = -.19$ for science self-concept in 57 countries; Nagengast & Marsh, 2012), and 2012 ($\beta = -.35$ for math self-concept in 68 countries; Marsh et al., 2020). While these studies have provided substantial cross-national evidence for the BFLPE, they are limited to the domains of math and science.

The evidence briefly reviewed here highlights that there is no cross-national BFLPE study for reading, which utilizes samples of high school students from a wide variety of developed and developing countries. Having such a study is crucial for two reasons. First, as mentioned above, self-concept becomes increasingly domain-specific with age (Marsh & Shavelson, 1985). Thus, as the only cross-national study of the BFLPE for reading self-concept was conducted using primary school students, the results cannot be generalized to older students. Second, in past cross-national studies, authors rationalize their focus on math and science subjects in terms of their content being relatively similar across countries (e.g., Marsh et al., 2020). However, such a focus is at a disservice to other important achievement areas that may be less similar across countries, such as reading (as the language to be learned varies). Indeed, self-concept in the reading domain is vastly different from those in math and science domains. Figure 1 displays the specific domains of academic self-concept, and highlights that verbal self-concepts are at the opposite end of the continuum from math (with the various science self-concepts closer to math than to verbal; also see Marsh & Seaton, 2015 for an

overview on dimensional comparison theory). Thus, we cannot simply assume that results from more math-like subjects will translate to results from more verbal subjects.

Therefore, we extend the examination of the cross-national generalizability of the BFLPE to the domain of reading for high school students, using data from the PISA2018 cohort. Specifically, we test the BFLPE for two subcomponents of reading self-concept (competence and difficulty), as well as for ratings of difficulty experienced in solving items on the PISA reading test. We describe all three reading self-beliefs in the next section.

1.2 Social Comparison Processes and Reading Self-Beliefs

1.2.1 Social Comparison Process Underlying the BFLPE

As mentioned in Section 1.1, the underlying mechanism of the BFLPE is the social comparison process (Festinger, 1954). People are motivated to make such comparisons to obtain plausible information for decision-making in daily life (e.g., Gruder, 1971). In terms of self-concept formation, students compare their own achievement in a specific domain with the achievements of their peers in the same domain (Marsh & Parker, 1984; Marsh & Seaton, 2015). That is, for the BFLPE, the peers are the frame-of-reference. Indeed, Huguet et al. (2009) found that the negative effect of class-average achievement (which follows a similar pattern to the effect of school-average achievement) was eliminated after controlling for students' comparisons with their class. In support of the social-comparison basis of the BFLPE, controlling for social comparisons minimizes the BFLPE. In the present study, we examine the social comparison basis of the BFLPE by differentiating between our reading self-belief measures.

1.2.1 Self-Concept (Competence and Difficulty)

The 2018 cohort was the first PISA cohort to split the measure of reading self-concept into two subscales of perceived competence and perceived difficulty, whereas previous rounds have usually only measured self-concept using perceived competence. PISA based this decision on evidence from Chapman and Tunmer (1995), who proposed differentiating these subscales to more

comprehensively identify students' full range of self-concept evaluations. Self-concept of perceived competence assesses the feelings of proficiency and skill in reading and reading-related activities (e.g., “I am a good reader”). Self-concept of perceived difficulty measures the extent to which individuals have difficulty with, or aversion to, reading and reading-related activities, events, and behaviors (e.g., “I have always had difficulty with reading”; see Section 2.2.1 for all items used in PISA2018). Thus, while perceived competence assesses a positively-valenced self-belief, perceived difficulty assesses a negatively-valenced self-belief. The assessment of both is designed to contribute to a more complete understanding of an individual’s self-concept.

1.2.2 PISA Test Difficulty Rating

In addition, the PISA2018 cohort also included a measure of the level of difficulty experienced by the students for the reading tasks within the PISA test assessment (e.g. “In the PISA reading test, many texts were too difficult for me”; see Section 2.2.1 for all items). We refer to this construct as the *PISA test difficulty rating*, to differentiate it from the perceived difficulty subscale of the reading self-concept construct described above. Although both measures assess difficulty in reading, self-concept of perceived difficulty concerns reading in general, while the PISA test difficulty rating is concerned specifically with the PISA reading assessment.

It is important to note that neither the self-concept items nor the PISA test difficulty rating items explicitly asked students to compare their reading abilities with their peers. The critical feature of the PISA test difficulty rating items, therefore, is that the self-evaluations a student needed to undergo to answer these questions was based entirely on the specific task at hand (i.e., the PISA reading assessment). Social comparisons are more likely when an individual is uncertain of their standing (Brown et al., 2007), implying that evaluations based on specific criteria provide less of an opportunity for comparisons with others (Marsh, Pekrun, et al., 2019), compared to items assessing domain-general self-beliefs. Therefore, because of this well-defined context, the PISA test difficulty rating has an absolute frame-of-reference, minimizing invocation of social comparison processes. In contrast, as the items for self-concept of perceived difficulty are domain-general, there is more of an

opportunity to compare one's reading difficulties with those of peers. Therefore, it can be said to have a more relative frame-of-reference.

Previous research has similarly juxtaposed self-belief measures in relation to this absolute vs relative frame-of-reference difference. The most salient of these is the differentiation between self-concept and self-efficacy (i.e., belief about one's capabilities to produce designated levels of performance; Bandura, 1994). While there are several similarities between the two constructs (e.g., perceived competence, domain specificity), social comparison processes are central to the distinction between them (Bong & Skaalvik, 2003). On the one hand, self-concept ratings invoke social comparison processes with evaluations of self-relative-to-others. On the other hand, self-efficacy measures tend to solicit goal-referenced evaluations that are task-specific and in-built (e.g., "how confident do you feel about having to solve an equation like $3x+5=17$ "; OECD 2014). Thus, in this way, self-efficacy measures are not dependent on comparisons with others. However, Marsh, Pekrun, et al. (2019) note that many so-called self-efficacy measures are really more like self-concept measures in that they invoke social comparison processes to respond to the item, by not including the goal-reference within the item. Hence, they demonstrated that BFLPEs were substantially minimized for pure self-efficacy measures based on absolute standards of comparison but were similar to BFLPEs based on self-concept ratings for so-called self-efficacy ratings based on relative standards of comparison.

In the present investigation, we seek an alternative test of the social comparison process underlying the BFLPE based on relative vs. absolute frames of reference. The PISA test difficulty rating is fundamentally different from pure self-efficacy ratings in that self-efficacy ratings are prospective in relation to future behavior, whereas the PISA test difficulty ratings are retrospective in relation to the PISA test that students had already taken. Nevertheless, pure self-efficacy and PISA test difficulty ratings share a reliance on an absolute standard of comparison that are task-specific and do not require social comparison processes to form a rating. Thus, we further extend past research to evaluate the effect of school-average achievement on student reading outcomes across countries, not only in relation to the two dimensions of reading self-concept that assess domain-specific self-beliefs

that allow for social comparisons, but also a measure specific to the PISA reading test that assesses task-specific self-beliefs with an absolute frame-of-reference.

1.3 The Present Study

The BFLPE is one of the most well-supported findings in social psychology (Marsh & Seaton, 2015). However, much of the evidence for its cross-national generalizability has been provided in the domains of math and science. There have been no cross-national studies of the BFLPE for reading in secondary school students, nor any that have explored the BFLPE separately for reading self-concept of competence and difficulty. The present study aims to address these three issues by using data from the PISA2018 cohort, which comprises responses from over half a million 15-year-old students from 72 countries/regions. We explore the effect of school-average achievement on reading self-concept of competence and difficulty, and draw a parallel with its effect on PISA test difficulty rating. We explore these effects first across the whole sample, and then for each country.

A recent cross-national study of 10-year-old students found that the association between self-concept and achievement was slightly stronger for difficulty than for competence (Lafontaine et al., 2019). However, Chapman and Tunmer (1995) stated that responses on the two scales become more similar with an increase in age, as do their correlations with achievement. Although previous research on the association between the two and achievement has only been considered at the individual level, we extrapolate to predict the following:

Hypothesis 1: There will be a BFLPE for both reading self-concept of perceived competence and of perceived difficulty (**H1a**), and these effect sizes will be comparable to each other (**H1b**).

Previous literature shows that the BFLPE is based on social comparisons (Marsh & Seaton, 2015). Items assessing reading self-concept of competence and difficulty allow for such social comparisons, while those assessing PISA test difficulty do not. Following from the Marsh, Pekrun, et al. (2019) study that showed the BFLPE to be substantially truncated for self-efficacy ratings that have a similar absolute frame-of-reference, we hypothesize the following:.

Hypothesis 2: There will not be a BFLPE for the PISA test difficulty rating.

Past studies on the cross-national generalizability of the BFLPE have either used samples of primary school students in OECD countries to examine the domain of reading (Guo et al., 2018), or of high school students in a broad range of countries to examine the domains of math and science (Marsh et al., 2020). As the BFLPE in these studies have been fairly consistent across the countries examined, we extend past findings to predict the following for reading self-beliefs in high school students:

Hypothesis 3: The effect of school-average achievement on reading self-concept of competence will be negative in all countries (**H3a**), and positive in all countries for reading self-concept of difficulty (i.e., the opposite direction of the effect of L1 achievement; **H3b**).

Hypothesis 4: The effect of school-average achievement on PISA test difficulty rating will be weak or non-significant in all countries.

2. Methods

2.1 Data and Participants

We used the cross-national PISA2018 dataset, which is publicly available through the OECD website (oecd.org/pisa/pisaproducts/). Students completed tests to assess their knowledge and skills in reading, math, and science, and answered questionnaires assessing a variety of psychosocial and family background variables. PISA utilizes a two-stage stratified sampling design. The first stage systematically samples schools from a comprehensive national list of all eligible schools with 15-year-old students. The second stage involves sampling thirty-five (where available) 15-year-old students from each school. These data constitute nationally representative samples after using the appropriate survey weights provided as part of the public database (OECD, 2019).

The raw PISA2018 dataset consists of responses from 612,004 students from 21,903 schools in 80 countries/economic regions. For the present study, data from countries with 100% missingness on our independent and dependent variables were removed. Specifically, data from Spain and

Vietnam were removed because these countries did not have reading achievement scores, data from Lebanon and Macedonia were removed because they did not answer the reading self-concept questions, and data from Belarus, Russia (mainland), Morocco, and Malaysia were removed as the OECD reported that the composite scores for reading self-concept of competence and difficulty did not perform well in these countries and, therefore, did not provide these in the dataset. Thus, analyses reported in this paper used data from 533,165 students from 19,366 schools in 72 countries. The remaining small amount of missing data was dealt with using multiple imputations (see details under Section 2.3).

2.2 Measures

Information about all variables used in the present study, including overall and country-by-country psychometric properties, is available from the PISA technical report (oecd.org/pisa/data/pisa2018technicalreport/). Information about means, standard deviations, and percent of missing data before imputations for all L1 variables and covariates are presented in the Supplementary Materials (Table S1).

2.2.1 Dependent Variables

We utilize the total scores (Warm estimates) for all our dependent variables, that were calculated by PISA and provided in the dataset (OECD, 2019).

2.2.1.1 Reading self-concept (competence and difficulty). Reading self-concept was measured using two subscales; perceived competence and difficulty. Three items assessed perceived competence (“I am a good reader”, “I am able to understand difficult texts”, and “I read fluently”), and the other three assessed perceived difficulty (“I have always had difficulty with reading”, “I have to read a text several times before completely understanding it”, and “I find it difficult to answer questions about a text”). All items were rated on a scale of 1 (*strongly disagree*) to 4 (*strongly agree*). Higher scores on the reading competence subscale are indicative of greater perceived competence in

reading, while higher scores on the difficulty subscale are indicative of greater perceived difficulty with reading.

2.2.1.2 PISA test difficulty rating. The level of difficulty experienced by the student specifically in the PISA reading test was measured using three items with the stem “In the PISA test you took before the break, you had to read several texts and answer reading comprehension questions. How do you feel about these reading tasks”. Each item (i.e., “There were many words I could not understand”, “Many texts were too difficult for me”, and “I was lost when I had to navigate between different pages”) was rated on a scale of 1 (*strongly disagree*) to 4 (*strongly agree*). Higher scores are indicative of greater experienced difficulty with the PISA reading test.

2.2.2 Independent Variables

2.2.2.1 L1 reading achievement. PISA measures reading achievement using 10 plausible values (PVs; see Statistical Analyses section). These PVs are obtained via models using item response theory to infer students’ abilities based on their performance on the PISA test (see the PISA2018 data manual for details). This variable represents the reading literacy exhibited by the test-taker in terms of their ability to understand, use, evaluate, reflect on, and engage with texts. Higher scores are indicative of greater reading literacy/achievement.

2.2.2.2 L2 reading achievement. First, each L1 reading achievement PV was grand mean centered. Then, we calculated L2 reading achievement as the average L1 reading achievement in each school, independently for each PV. The resulting 10 sets of values were used in the same way as the L1 reading achievement PVs (see Section 2.3).

2.2.3 Covariates

We controlled for several L1 covariates typically used in BFLPE studies (e.g., Marsh et al., 2020). Specifically, we accounted for students’ gender, age, SES (a composite index of economic, social, and cultural status), year in school (grade compared to modal grade in the country), grade repetition, immigrant status, and language spoken at home (see Table 1 notes for scoring of variables).

All covariates were grand-mean centered. Table 1 presents correlations amongst all L1 variables and covariates.

2.3 Statistical Analyses

We conducted all analyses in R (Version 3.6.2; R Core Team, 2019), the code for which is available here: tinyurl.com/y55fnesu. The final data (see Section 2.1) were multiply imputed using the Amelia II package (Honaker, 2009). We created ten imputed datasets, retaining all variables and covariates mentioned in Section 2.2.3. We assigned each L1 and L2 reading achievement PV to one of the 10 imputed datasets, in accordance with the PISA data manual.

We then conducted all analyses separately in each dataset and then combined them using Rubin's (1987) rules. Correlational analyses were conducted using the *miceadds* package (Robitschz, 2019) and multilevel models using the *lme4* package (Bates et al., 2015). For the multilevel models, we included random intercepts at the school and country level to account for clustering of students within schools, and of schools within countries. We included fixed effects of L1 and L2 reading achievement as well as their random effects at the country level. All models were weighted using the PISA-provided final survey weight, normalized for each country (i.e., sum of the weights in each country was equal to the sample size in that country). We present models with covariates in the main manuscript, although results were similar when we did not include covariates (Supplementary Materials Table S2).

We interpret the size of the fixed effects based on recommendations by Else-Quest et al. (2010) who stated that an effect size of less than .1 can be considered trivial when sample sizes are large, as estimates of even .01 may be statistically significant. We interpret random effects, and the generalizability of fixed effects across countries, based on recommendations from Marsh (2016). Marsh suggested that there is good support for the generalizability of an a-priori prediction if the standard deviation of country-to-country variation (i.e., the square root of the random variance component) is less than half that of the corresponding fixed-effect estimate in support of that prediction (as the direction of the effect will not change even at relatively extreme values).

We also graphed forest plots containing beta estimates (with 95% CI) for the effect of school-average achievement on our outcome variables in each country, to further explore country-to-country variations in these effects. These beta estimates were extracted from two-level models (clustered at the school level) run independently in each country, and included all covariates outlined in Section 2.2.3.

3. Results

3.1 Multilevel Models

3.1.1 *Fixed Effects*

Table 2 displays results from three survey-weighted multilevel models (our main cross-national analyses). Results indicate that the main effect of student-level reading achievement was positive and significant for self-concept of reading competence, and negative and significant for self-concept of reading difficulty and PISA test difficulty rating. The magnitude of this effect was similar for all three dependent variables ($|\beta| = .316-.345$).

The main effect of school-average reading achievement, our test of the BFLPE, was in the opposite direction to that of student-level reading achievement for all models. Thus, the higher the school-average achievement, the lower the student's reading self-concept of perceived competence, perceived difficulty, and PISA test difficulty rating (controlling for individual-level achievement and our covariates). However, the magnitude of the school-average achievement varied considerably across the different reading self-belief measures. Specifically, reading competence showed the strongest BFLPE ($\beta = -.198$), followed by reading difficulty ($\beta = .120$). While the effect of L2 reading achievement for PISA test difficulty rating was significant, the effect size was close to zero ($\beta = .029$). Thus, it may be considered trivial in size (Else-Quest et al., 2010). Our findings provide support for Hypothesis 1a (BFLPEs were present for the two reading self-concept subscales), do not support Hypothesis 1b (the BFLPE was larger for reading self-concept of perceived competence than for

reading self-concept of perceived difficulty), and provide partial support for Hypothesis 2 (weak, but negligible BFLPE for PISA test difficulty rating).

3.1.2 Random Effects

Following recommendations from Marsh (2016), although the country-to-country variation for the effect of school-average achievement was largest for self-concept of perceived competence than for the other two outcomes based on random effects alone ($SD = 0.085$), the BFLPE for competence was the most generalizable across countries given the large main effect of school-average achievement ($\beta = -.198$; this beta estimate is larger than two times the random effect standard deviation). Thus, it can be said that the negative effect of school-average achievement on self-concept of perceived competence has cross-national generalizability. The generalizability of the effect of school-average achievement across countries was marginally weaker for self-concept of difficulty and much weaker for PISA test difficulty rating, given that their SDs were more than half of the fixed-effect (self-concept of perceived difficulty: $SD = 0.072$; $\beta = .120$; PISA test difficulty rating: $SD = 0.067$, $\beta = .029$).

3.2 Country-Specific BFLPEs

To get a better sense of the country-to-country variation in the effect of school-average achievement on the three dependent variables, we present forest plots (Figure 2). These forest plots graphically represent the country-to-country variation in the beta estimates for school-averaged reading achievement for each of our three dependent variables (we provide the exact numerical values for effect sizes and standard errors for each country in Supplementary Materials Table S3). In terms of direction, the effect of school-average achievement was most consistent across countries for reading self-concept of perceived competence, and least consistent for PISA test difficulty rating.

Specifically, the effect of L2 reading achievement on L1 reading self-concept of perceived competence was negative and significant in 66 of the 72 countries ($\beta = -.069$ to $-.368$), and never positive. Thus, it suggests that while the magnitude of the BFLPE for reading competence showed

some country-to-country variation, it was negative in all countries, and significantly so in most (supporting Hypothesis 3a). The effect of L2 reading achievement on reading self-concept of perceived difficulty was also consistent; all the significant effects were positive (57 countries, $\beta = .052$ to $.293$), although the non-significant effects were on both sides of zero (positive in 10 countries, negative in 5 countries; partial support for Hypothesis 3b). The effect of L2 reading achievement on L1 PISA test difficulty rating was non-significant in most countries (47 countries; partial support for Hypothesis 4), and even the significant effects were on both sides of zero (19 positive and 6 negative; $\beta = -.111$ to $.206$). Thus, our results provide support for the cross-national generalizability of the BFLPE for self-concept of competence and difficulty, as well as for the weak effect of school-average achievement on the PISA test difficulty rating.

4. Discussion

Although studies examining the BFLPE are plentiful, examinations of its generalizability have been largely limited to math and science subjects. As the content covered in these subjects tends to be relatively consistent across countries and self-concepts in these domains differ vastly from those in more verbal-like subjects, conclusions of the universality of the underlying mechanism (i.e., social comparison process) may be limited. It is, therefore, important to extend such cross-national research to the domain of reading. Bridging this gap, our study is the first: (i) cross-national study of the BFLPE for reading in secondary school students, (ii) to test the generalizability of the BFLPE for reading self-concept over a wide variety of countries (i.e., both developing and developed countries) and (iii) to test the BFLPE across two separate subscales of reading self-concept as well as for difficulty experienced specifically during the PISA reading test. Results indicated that the BFLPE for reading self-concept of 15-year-old students was robust across the 72 countries examined (particularly for perceived competence). In addition, the effect of school-average achievement on individual-level experienced difficulty with the PISA reading test (i.e., PISA test difficulty rating) was non-significant in most countries, showing that the social comparison process was largely not in play for this construct.

4.1 Social Comparison Processes

Previous research has provided evidence for social comparison process as the mechanism underlying the BFLPE. That is, in order to evaluate their performance, students compare their abilities in a certain domain with the abilities of their peers in that domain. We provide a test of this underlying mechanism by contrasting the effects of school-average achievement on measures that allowed for such social comparisons by keeping the self-evaluations general to a domain (self-concept of competence and difficulty), with those on measures that specified the basis of such evaluations to a defined task (PISA test difficult rating).

4.1.1 Differences Between the Two Self-Concept Subscales

There was substantial support for the BFLPE—and the cross-national generalizability of the BFLPE—for both self-concept subscales. However, it is interesting to note that the associations of these two subscales were of a more similar magnitude with student-level reading achievement ($|\beta| = .345$ and $.316$, respectively) than with school-average reading achievement ($|\beta| = .198$ and $.120$, respectively).

Why is the BFLPE larger for self-concept of perceived competence than perceived difficulty? Such a pattern may imply that social comparison processes operate more strongly for evaluations of self-concept of competence than for self-concept of difficulty. This might be due to the valence of the items assessing the two subscales. Self-concept of competence measures a positively-valenced self-evaluation (e.g., I am a good reader), but self-concept of difficulty measures a negatively-valenced self-evaluation (e.g., I have always had difficulty with reading). Fredricksons' (2001) broaden-and-build theory posits that positive emotions increase an individual's levels of attention and awareness, and serve as instruments of individual growth and social connections, whereas negative emotions do so to a lesser extent. While self-concept is considered a motivation rather than an emotion (Basarkod & Marsh, 2020), it is probable that social comparisons regarding differently valenced evaluations of self-concept follow the same broaden-and-build pattern. Evaluations of competence may lead individuals to be more open, enabling them to acknowledge others' levels of competence and their

own standing in relation to them. In contrast, evaluations of difficulty may cause individuals to shut off and be less aware of their peers' levels of difficulty and their standing in relation to these peers, thereby reducing the strength of social comparisons. Future research is, however, required to confirm this supposition.

4.1.2 Differences Between Self-Concept Perceived Difficulty and PISA Test Difficulty

Our results demonstrate that the BFLPE is severely truncated when there is an absolute frame-of-reference for evaluations of reading self-beliefs. That is, while we find a BFLPE for the self-concept perceived difficulty items that were generic to the domain of reading, this effect was negligible when students were provided with an absolute frame-of-reference on which to base their evaluations of reading difficulty. Although neither the items assessing self-concept of perceived difficulty, nor those measuring PISA test difficulty ratings, explicitly asked students to rate their difficulty with reading in comparison to their peers, it is apparent that the social comparison process operated more strongly for the former than for the latter.

These findings contrasting relative and absolute frames of reference are in line with past research that show the BFLPE to be stronger for self-concept than for self-efficacy (Marsh, Pekrun, et al., 2019). As mentioned in Section 1.2.2, items assessing what Marsh, Pekrun et al. (2019) referred to as pure self-efficacy also have an absolute frame-of-reference, in that they explicitly state the criterion against which students need to evaluate themselves. However, while PISA test difficulty was a *retrospective* rating with an absolute frame-of-reference (i.e., evaluations based on a specific task students already completed), self-efficacy items involve a *prospective* rating with an absolute frame-of-reference (i.e., evaluations based on a specific task students imagine themselves doing in the future). In addition, past research has only compared self-concept and self-efficacy in relation to the BFLPE using scales assessing positive evaluations (e.g., of competence), or a mix of positive and negative evaluations, (e.g., mix of items assessing both competence and difficulty), but not both separately (Marsh, Pekrun, et al., 2019). Despite these differences, our results were matched with those from past studies comparing measures of self-concept and self-efficacy. Still, future research is

needed to explicitly juxtapose the effect of school-average achievement on measures of self-concept with its effect on absolute frame-of-reference measures that are prospective vs retrospective, and negatively- vs positively-valenced.

4.2 Cross-National Generalizability of Results

In the universalist perspective in cross-cultural psychology, there is an emphasis on replicability of results, empirical tests, and cross-cultural generalizability of support for theoretical predictions. Such examinations of the generalizability of a given effect are traditionally conducted using meta-analyses. However, the extent to which meta-analyses can provide evidence for the cross-national generalizability of an effect depends substantially on the degree to which the individual studies contained within it represent samples from varied countries. Indeed, the only known meta-analysis on the BFLPE to date (Fang et al., 2018), while consisting of studies using varied samples for math and science subjects, consisted largely of Western, educated, industrialized, rich and democratic (WEIRD) samples for reading self-concept (with 10 effect sizes from Europe and America, and two from Asia). The use of large-scale cross-national datasets, such as the PISA data used here, overcome such drawbacks of meta-analysis (see Marsh et al. 2020 for a detailed discussion on the juxtaposition of meta-analytic studies and cross-national studies based on PISA data).

The most salient finding of the current investigation was that the BFLPE for reading self-concept of competence was never positive, and the BFLPE for reading self-concept of difficulty was never significantly negative. The remarkable cross-national support for the BFLPE for reading self-concept suggests that the mechanism upon which this effect is based (i.e., social comparison) constitutes a cross-nationally valid theory of self-concept formation. While previous studies have provided such evidence in relation to general, math, and science self-concepts, the current study is the first to provide robust cross-national support for the BFLPE for reading self-concept. This finding is important in that it highlights that social comparison processes are universal, even when the content of the subject under consideration may vary between countries (i.e., different countries speak different languages, and different languages have different rules in terms of grammar, syntax, etc).

In terms of comparisons of the magnitude of the BFLPE with previous cross-national studies with math and reading (Marsh et al., 2020), the effect for self-concept of competence ($\beta = -.20$) and difficulty ($\beta = .12$) were smaller than that for the BFLPE for math self-concept in PISA2003 ($\beta = -.31$) and 2012 ($\beta = -.35$). The BFLPE for competence was similar to that for science self-concept in PISA2009 ($\beta = -.19$), while the BFLPE for difficulty was smaller. This is partly in line with the only known cross-national study that examined, in parallel, the size of the BFLPE for math, science, and reading (Guo et al., 2018), which showed that the BFLPE for reading ($\beta = -.22$) was smaller than that for math ($\beta = -.32$), but larger than that for science ($\beta = -.16$). Interestingly, although the Guo et al. (2018) study was conducted using data from primary school students from 15 OECD countries, the magnitude of the average BFLPE for reading self-concept in their study, was comparable to that for reading self-concept of competence in our study of high school students from 72 developing and developed countries. While BFLPEs are expected to be larger for older students, this trend may be masked when examining a broader range of developed and developing countries. Future research that examines the BFLPE for primary school students using samples from both developed and developing countries can shed more light on this issue.

4.3 Limitations

Our findings, and our inferences based on them, require caveating. The present investigation is based on a single wave of cross-sectional data, limiting our inference regarding causality. However, various combinations of longitudinal, quasi-experimental, matching and true experimental designs, and even introspective diary studies have consistently provided support for our underlying assumption that school-average achievement predicts individual level self-concept (although usually for the math domain; e.g., Alicke et al., 2010). In addition, although we compare results based on self-concept measures and the PISA test difficulty measure, in terms of the relative vs. absolute frame-of-reference comparison, a stronger test would be to explicitly state the standard of comparison again peers for the self-concept items, and making the absolute nature of the PISA test difficulty rating more explicit (e.g., asking students what percentage of the test items they think they answered correctly). Still, we provide initial evidence for the generalizability of the difference in effect of school-average

achievement between items that did and did not have an absolute frame-of-reference, extending such results beyond measures of self-efficacy used previously (e.g., Marsh, Pekrun, et al., 2019).

4.4 Conclusion

Our study addresses several gaps in the BFLPE literature and provides robust cross-national evidence for the BFLPE for reading self-concept. Our findings of the universality of this effect are important considering the close relationship between self-concept and other important educational outcomes including achievement and long-term aspirations. Given the reciprocal relationship between achievement and self-concept (Marsh & Seaton, 2015), a diminished reading self-concept due to comparisons with peers is likely to lead to diminished reading achievement (Marsh, 1987), consequently preventing students from reaching their full potential in this domain (e.g., Marsh et al., 2007). Parents and teachers should take this into consideration when contemplating the consequences of high-achieving/selective schools on the educational outcomes of students.

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Table 1*Pearson's Correlations for All L1 Study Variables*

	1	2	3	4	5	6	7	8	9	10
1 Reading Competence										
2 Reading Difficulty	-.319									
3 PISA Test Difficulty	-.311	.493								
4 L1 Reading Achievement	.258	-.263	-.370							
5 Age	.013	-.004	-.015	.033						
6 Gender	-.079	.028	-.005	-.138	.001					
7 SES	.186	-.153	-.257	.387	-.007	.010				
8 Modal Grade	.083	-.064	-.102	.242	.255	-.057	.211			
9 Grade Repetition	-.102	.087	.114	-.254	.008	.061	-.184	-.447		
10 Immigrant Status	.030	.007	.007	.014	.011	.008	.056	.009	.058	
11 Language Spoken at Home	-.025	.062	.081	-.121	.001	.013	-.036	.024	.059	.303

Note. Correlations in gray are not statistically significant (i.e., $p > .05$). Gender: 1 = females and 2 = males; grade repetition: 0 = no, 1 = yes; immigrant status: 1 = natives, 2 = second-generation immigrants, 3 = first-generation immigrants; language spoken at home: 0 = English and 1 = not English.

Table 2

Results From Survey-Weighted Multilevel Models Predicting Reading Self-Concept Subscales and PISA Test Difficulty Rating

	M1: SC Competence		M2: SC Difficulty		M3: PISA Test Difficulty	
	β	<i>SE</i>	β	<i>SE</i>	β	<i>SE</i>
Fixed Effects						
Intercept	-0.027	0.031	-0.034	0.024	0.001	0.024
L1 Reading Achievement	0.345*	0.010	-0.316*	0.008	-0.339*	0.008
L2 Reading Achievement	-0.198*	0.011	0.120*	0.010	0.029*	0.009
Covariates						
Age	0.007*	0.002	0.000	0.002	-0.004*	0.001
Gender	-0.043*	0.001	-0.007*	0.001	-0.044*	0.001
SES	0.129*	0.002	-0.073*	0.002	-0.109*	0.002
Modal Grade	-0.017*	0.002	0.013*	0.002	0.001	0.002
Repeated Year	-0.022*	0.002	0.011*	0.002	0.011*	0.002
Immigration Status	0.019*	0.002	-0.004*	0.002	0.004*	0.002
Language Spoken at Home	-0.018*	0.002	0.017*	0.002	0.025*	0.002
Random Effects						
	<i>SD</i>		<i>SD</i>		<i>SD</i>	
L2 Intercept	0.147		0.123		0.130	
L3 Intercept	0.265		0.206		0.205	
L1 Reading Achievement L3	0.082		0.065		0.068	
L2 Reading Achievement L3	0.085		0.072		0.067	
Residual	0.902		0.931		0.888	

Note. Parameter estimates (β) for fixed effects that differ from zero by more than two standard errors (*SE*) are statistically significant ($p < .05$), and are indicated by *. Random effects are presented in standard deviations (*SD*).

Figure 1*Structure of Academic Self-Concept*

Note. The theoretical model of the structure of academic self-concept, which includes a wider variety of specific academic facets than Marsh and Shavelson (1985). Full lines indicate stronger domain membership, while dashed lines indicate weaker domain membership. Adapted with permission from Marsh, H. W. (2007). *Self-concept theory, measurement and research into practice: The role of self-concept in Educational Psychology*. British Psychological Society.

Figure 2

Country-by-Country Variation in Beta Estimates (with 95% Confidence Intervals) Predicting Reading Self-Beliefs

Note. Beta estimates are taken from 2-level models run separately in each country, for each dependent variable, controlling for L1 reading achievement and covariates. Blue indicates significant estimates (95% CI line does not cross zero), while red indicates non-significant results (95% CI line crosses 0).

Supplementary Materials

Table S1

Means, Standard Deviations, and Percent Missingness Before Imputations for all L1 Variables and Covariates Used in the Study.

		Mean	SD	%Miss
1	Reading Competence	-0.006	0.970	8.067
2	Reading Difficulty	0.083	0.990	7.860
3	PISA Test Difficulty	0.191	1.018	7.324
4	L1 Reading Achievement	457.172	108.448	0
5	Age	15.786	0.291	0
6	Gender	1.502	0.500	0
7	SES	-0.262	1.100	2.460
8	Modal Grade	-0.160	0.637	0.544
9	Grade Repetition	0.111	0.314	5.327
10	Immigrant Status	1.207	0.549	5.549
11	Language Spoken at Home	1.164	0.371	2.345

Table S2

Results From Survey-Weighted Multilevel Models Predicting Reading Self-Concept Subscales and PISA Test Difficulty (Without Covariates)

	MS1: SC Competence		MS2: SC Difficulty		MS3: PISA Test Difficulty	
	β	SE	β	SE	β	SE
Fixed Effects						
Intercept	-0.026	0.033	-0.034	0.025	0.000	0.026
L1 Reading Achievement	0.373*	0.010	-0.326*	0.008	-0.352*	0.009
L2 Reading Achievement	-0.126*	0.011	0.081*	0.010	0.029*	0.010
Random Effects						
	SD		SD		SD	
L2 Intercept	0.147		0.123		0.139	
L3 Intercept	0.281		0.213		0.223	
L1 Reading Achievement L3	0.084		0.066		0.071	
L2 Reading Achievement L3	0.084		0.072		0.072	
Residual	0.908		0.933		0.893	

*Note. Parameter estimates (β) for fixed effects that differ from zero by more than two standard errors (SE) are statistically significant ($p < .05$), and are indicated by *.*

Random effects are presented in standard deviations (SD).

Table S3*Main Effect of School-Average Achievement on Each Reading Outcome Separately for Each Country*

	SC Competence		SC of Difficulty		PISA Test Difficulty	
	β	<i>SE</i>	β	<i>SE</i>	β	<i>SE</i>
Albania	-0.106*	0.046	0.103*	0.049	0.014	0.045
Argentina	-0.279*	0.029	0.100*	0.028	-0.055	0.036
Australia	-0.276*	0.025	0.181*	0.023	0.112*	0.023
Austria	-0.143*	0.033	0.115*	0.032	-0.035	0.032
Baku (Azerbaijan)	-0.262*	0.060	0.033	0.060	-0.118	0.063
Belgium	-0.229*	0.028	0.206*	0.029	0.110*	0.028
Bosnia and Herzegovina	-0.206*	0.041	0.125*	0.043	0.051	0.041
Brazil	-0.175*	0.026	0.126*	0.024	-0.017	0.024
Brunei Darussalam	-0.193*	0.034	0.039	0.026	0.010	0.033
B-S-J-Z (China)	-0.086*	0.029	0.117*	0.029	-0.024	0.027
Bulgaria	-0.094*	0.035	-0.001	0.038	-0.042	0.038
Canada	-0.268*	0.026	0.178*	0.026	0.044	0.025
Chile	-0.302*	0.037	0.237*	0.036	-0.021	0.035
Chinese Taipei	-0.128*	0.031	0.166*	0.031	0.137*	0.030
Colombia	-0.305*	0.033	0.232*	0.032	0.082*	0.033
Costa Rica	-0.165*	0.040	0.101*	0.047	-0.039	0.044
Croatia	-0.160*	0.034	0.168*	0.034	0.101*	0.033
Czech Republic	-0.168*	0.029	0.152*	0.029	0.009	0.030
Denmark	-0.301*	0.046	0.154*	0.044	-0.002	0.039
Dominican Republic	-0.287*	0.046	0.136*	0.049	0.091*	0.044
Estonia	-0.079	0.043	0.113*	0.037	-0.072	0.038
Finland	-0.172*	0.049	0.194*	0.057	0.064	0.051
France	-0.258*	0.037	0.220*	0.034	0.153*	0.035
Georgia	-0.209*	0.042	0.062	0.043	0.000	0.039
Germany	-0.132*	0.033	0.109*	0.030	-0.025	0.029

Greece	-0.129*	0.032	0.143*	0.032	0.028	0.033
Hong Kong	-0.094*	0.033	0.088*	0.032	0.025	0.031
Hungary	-0.044	0.034	0.112*	0.038	-0.034	0.034
Iceland	-0.049	0.074	0.027	0.073	-0.042	0.070
Indonesia	-0.177*	0.036	0.007	0.031	0.027	0.036
Ireland	-0.352*	0.049	0.285*	0.050	0.156*	0.044
Israel	-0.263*	0.031	0.212*	0.031	0.206*	0.028
Italy	-0.195*	0.030	0.136*	0.030	0.015	0.026
Japan	-0.368*	0.034	0.293*	0.033	0.031	0.036
Jordan	-0.215*	0.049	0.037	0.044	0.092*	0.042
Kazakhstan	-0.296*	0.029	-0.042	0.024	0.049*	0.023
Korea	-0.059	0.036	0.081*	0.034	-0.074*	0.034
Kosovo	-0.127*	0.054	-0.019	0.056	0.005	0.051
Latvia	-0.237*	0.040	0.115*	0.038	0.047	0.038
Lithuania	-0.161*	0.041	0.165*	0.039	0.018	0.033
Luxembourg	-0.230*	0.045	0.239*	0.040	0.140*	0.033
Macao	-0.231*	0.063	0.166*	0.048	0.139*	0.061
Malta	-0.132*	0.052	0.153*	0.042	0.084	0.046
Mexico	-0.121*	0.038	0.084*	0.041	0.020	0.041
Moldova	-0.280*	0.041	0.092*	0.032	-0.111*	0.036
Montenegro	-0.086	0.056	0.098*	0.046	0.040	0.048
Moscow Region	-0.060	0.069	0.165*	0.070	-0.110	0.073
Netherlands	-0.228*	0.038	0.184*	0.038	-0.008	0.034
New Zealand	-0.288*	0.037	0.171*	0.038	0.071*	0.033
Norway	-0.222*	0.048	0.103*	0.045	0.026	0.044
Panama	-0.195*	0.047	0.121*	0.049	0.023	0.047
Peru	-0.279*	0.035	0.166*	0.032	0.107*	0.033
Philippines	-0.320*	0.035	0.124*	0.034	0.131*	0.035
Poland	-0.168*	0.037	0.205*	0.039	0.058	0.041
Portugal	-0.108*	0.035	0.046	0.033	-0.010	0.036

Qatar	-0.161*	0.028	0.052*	0.026	-0.014	0.028
Romania	-0.117*	0.033	0.027	0.034	-0.069*	0.032
Saudi Arabia	-0.255*	0.056	0.063	0.045	0.072	0.052
Serbia	-0.174*	0.030	0.087*	0.033	0.056	0.032
Singapore	-0.069*	0.029	-0.030	0.028	-0.072*	0.028
Slovak Republic	-0.134*	0.030	0.121*	0.033	0.071*	0.035
Slovenia	-0.121*	0.032	0.116*	0.032	0.046	0.036
Sweden	-0.272*	0.040	0.217*	0.040	0.076	0.039
Switzerland	-0.204*	0.036	0.190*	0.036	0.080*	0.034
Tatarstan	-0.079*	0.033	0.077*	0.035	0.023	0.037
Thailand	-0.148*	0.036	-0.013	0.032	0.048	0.035
Turkey	-0.320*	0.036	0.078*	0.032	-0.072*	0.031
Ukraine	-0.133*	0.031	0.098*	0.031	-0.012	0.031
United Arab Emirates	-0.227*	0.018	0.025	0.019	-0.072*	0.019
United Kingdom	-0.264*	0.035	0.256*	0.035	0.114*	0.029
United States	-0.224*	0.044	0.121*	0.040	0.023	0.039
Uruguay	-0.139*	0.039	0.161*	0.042	-0.059	0.041
Average	-0.192		0.122		0.027	

Notes. This table contains numerical values for Figure 2 presented in the main manuscript.

Parameter estimates (β) of fixed effects that differ from zero by more than two standard errors (SE) are statistically significant ($p < .05$), and are indicated by *.